Summit Virtual Chassis Design and Installation Guide

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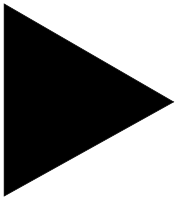

Summit Virtual Chassis Design and Installation Guide

The Summit™ Virtual Chassis™ is a high-performance, low-cost external backplane that connects up to eight stacked or distributed Summit switches into one cohesive system. The Summit Virtual Chassis comes with eight SummitLink™ backplane channels.

SUMMARY OF FEATURES

Features of the Summit Virtual Chassis include the following:

- Increased port density
- Policy-based Quality of Service (QoS)
- Load-sharing links
- Extensive fault-tolerant capabilities
  - Redundant power supplies
  - Hot-swappable switches
- Hot-swappable Virtual Chassis
  - Environmental sensors

INCREASED PORT DENSITY

The Summit Virtual Chassis can be combined with any member of the Summit switch family. When four Summit Virtual Chassis are used with eight Summit1 switches, up to 32 Gigabit Ethernet ports can be connected using the Virtual Chassis external backplane. When two Virtual Chassis are combined with eight Summit48 switches, up to 384 10/100 Mbps Ethernet ports can be connected. A single Virtual Chassis connected to eight Summit3 switches provides 192 10/100 Mbps ports.

POLICY-BASED QUALITY OF SERVICE (QOS)

Policy-based QoS is a feature of the Summit switch family. QoS profiles are defined in the Summit switch, and allow you to specify priority, and minimum and maximum bandwidth per traffic group. You can define QoS traffic groups based on the following:

- Internet Protocol (IP) destination address
- Virtual LAN (VLAN) (including IP subnet or protocol)
- Media Access Control (MAC) destination address
- Physical source port
- 802.1p prioritization

ExtremeWare™ software running on the Summit switch maps the QoS profiles into queues on each port of the switch. When up to eight Summit switches are connected to a Summit Virtual Chassis, four interconnecting queues for each switch (totaling 32 queues) are allocated on each Summit Virtual Chassis link.

LOAD-SHARING LINKS

For increased fault tolerance, throughput, and bandwidth, two- or 4four-port load-sharing links can be used to create parallel paths between Summit switches and two or four Summit Virtual Chassis.

Figure 1 shows two Summit1 switches connected using four parallel paths to four Summit Virtual Chassis. The result is a full mesh of parallel paths between each Summit switch and the Summit Virtual Chassis.

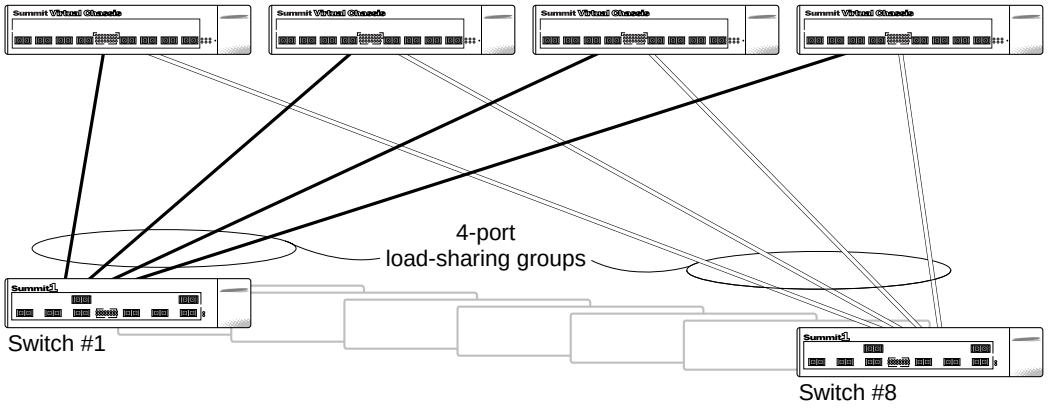

Figure 1: Four-port load-sharing links with the Summit Virtual Chassis

Figure 2 shows two Summit48 switches using two parallel paths to two Summit Virtual Chassis. The result is a full mesh of parallel paths.

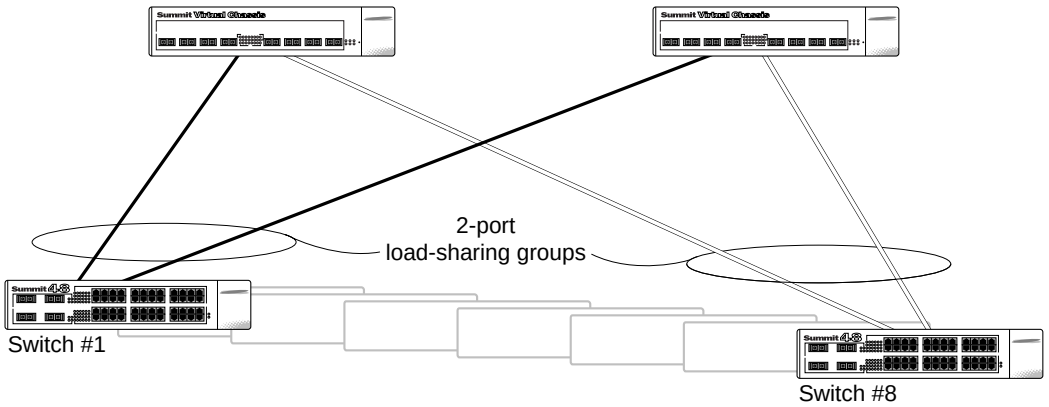

Figure 2: Two-port load-sharing links with the Summit Virtual Chassis

Using load-sharing links, the Summit Virtual Chassis distributes traffic to and from each Summit switch on any of the parallel connected paths. This results in faster data throughput among the switches connected to the Summit Virtual Chassis.

Another advantage of parallel paths between Summit switches and the Summit Virtual Chassis is that the allocation of traffic between connections is transparent to the address tables and routing protocols. If a connection is broken, traffic is redirected to a parallel path without causing an address table or routing table update.

EXTENSIVE FAULT TOLERANT CAPABILITIES

The Summit Virtual Chassis includes a number of fault tolerant capabilities, including the following:

- Redundant power supplies
- Hot-swappable switches
- Hot-swappable Virtual Chassis
- Environmental sensors

REDUNDANT POWER SUPPLIES

The Summit Virtual Chassis is equipped with two internal load-sharing power supplies. A single power supply provides power to the Summit Virtual Chassis. Combined, the two power supplies provide load-balancing to increase the longevity of each supply, and deliver uninterrupted service in the event of a failure.

In addition to the two internal power supplies, the Summit Virtual Chassis comes with dual external redundant power supplies (RPS) that deliver power for up to two Summit switches in the stack. DC cables are provided to connect each RPS output to a single Summit switch.

The Summit Virtual Chassis has two power sockets. The upper power socket provides power to one of the Summit Virtual Chassis internal power supplies. It also provides backup power to the Summit switch that is connected to the Summit Virtual Chassis using the upper RPS port.

The lower power socket provides power to the second Summit Virtual Chassis internal power supply, and to the Summit switch that is connected to the Summit Virtual Chassis using the lower RPS port.

HOT-SWAPPING SUMMIT SWITCHES AND SUMMIT VIRTUAL CHASSIS UNITS

You can easily add, remove, and replace Summit switches that are interconnected with the Summit Virtual Chassis without affecting users linked to other switches in the stack. No actions are required prior to disconnecting a Summit switch, removing it from the stack, adding a new switch to the stack, or replacing a switch. Other switches connected to Summit Virtual Chassis continue to operate normally. When a switch is replaced or added, users connected to the new switch can automatically communicate with devices attached to other switches in the stack.

When a stack of Summit switches are connected to two or more Summit Virtual Chassis, you can hot-swap one of the Virtual Chassis without affecting communication between devices attached to the stack. If a system LED on a Summit Virtual Chassis indicates a failure, the Summit Virtual Chassis can be disconnected, removed from the stack and replaced, while remaining transparent to all users. All traffic continues to pass through the operational Summit Virtual Chassis while the failed unit is replaced.

ENVIRONMENTAL SENSORS

The Summit Virtual Chassis is equipped with sensors that monitor the internal temperature and send an alert if the temperature exceeds 60 degrees centigrade.

Fans in the Summit Virtual Chassis are built with a tachometer sensor that detects a fan failure if the rotation speed decreases by 20%. This allows you to make necessary repairs to the Summit Virtual Chassis before a failure occurs.

SUMMIT VIRTUAL CHASSIS FRONT VIEW

Figure 3 shows the front panel view of the Summit Virtual Chassis.

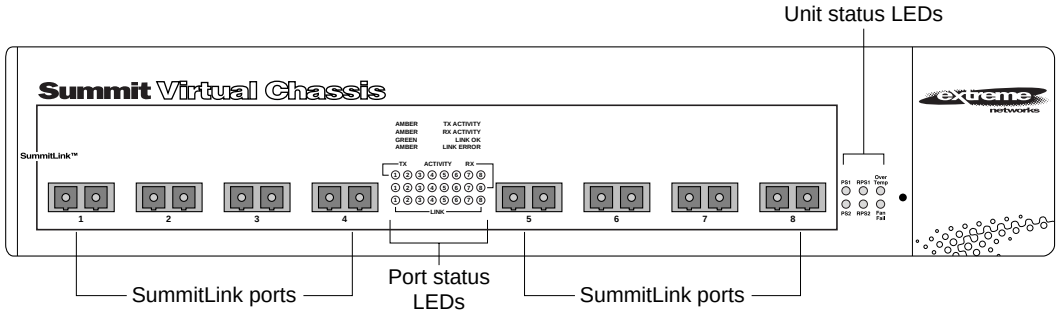

Figure 3: Summit Virtual Chassis front panel

PORTS

The Summit Virtual Chassis has eight SummitLink ports. All the ports use SC connectors and support the same media and distances as 1000BASE-SX over 50/125 micron or 62.5/125 micron fiber-optic cable. The maximum cable length between a Summit switch and the Summit Virtual Chassis is 260 meters. SummitLink ports are designed for connecting the Summit Virtual Chassis only to a Summit switch. SummitLink ports do not support connections to any other device type.

LEDS

Table 1 describes the LED behavior on the Summit Virtual Chassis.

Table 1: Summit Virtual Chassis LEDs

Unit Status LEDs	Color	Indicates
PS1	Green	Power supply #1 of the Summit Virtual Chassis is operating.
	Off	The Summit Virtual Chassis is indicating a power supply failure.
RPS1	Green	The first redundant power supply (RPS) of the Summit Virtual Chassis is powering a Summit switch.
PS2	Green	Power supply #2 of the Summit Virtual Chassis is operating.
	Off	The Summit Virtual Chassis is indicating a power supply failure.
RPS2	Green	The second RPS of the Summit Virtual Chassis is powering a Summit switch.
OVER TEMP	Off	The Summit Virtual Chassis temperature is normal.
	Yellow	The Summit Virtual Chassis is indicating an overheat condition (>60 degrees Celsius).
FAN FAIL	Off	The Summit Virtual Chassis fan is operating properly.
	Yellow	The Summit Virtual Chassis fan speed has slowed to 80% or less of full rotational speed, and should be replaced.

Table 1: Summit Virtual Chassis LEDs (continued)

Unit Status LEDs	Color	Indicates
SummitLink Port Status LEDs		
Link	Green	Link is present.
	Yellow	Link error.
	Off	No link, or either the Summit Virtual Chassis or the Summit switch attached to this port is powered off.
TX Activity	Yellow	Frames are being transmitted on this port.
	Off	No transmit activity detected on this port.
RX Activity	Yellow	Frames are being received on this port.
	Off	No receive activity detected on this port.

SUMMIT VIRTUAL CHASSIS REAR VIEW

Figure 4 shows the rear panel view of the Summit Virtual Chassis.

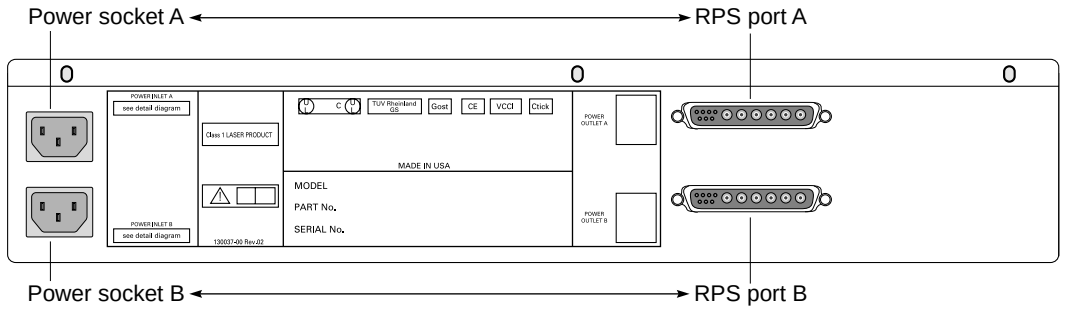

Figure 4: Summit Virtual Chassis rear panel

POWER SOCKETS

The Summit Virtual Chassis has two power sockets. The upper power socket provides power to one of the internal Summit Virtual Chassis power supplies. It also provides redundant load-shared power to the Summit switch connected to the Summit Virtual Chassis using RPS port A.

The lower power socket provides power to the second internal power supply, and to the Summit switch connected to the Summit Virtual Chassis using RPS port B.

The upper power socket powers only the upper RPS port. The lower power socket powers only the lower RPS port.

If you want to distribute the input AC power source across multiple, individual circuit breakers, you must plug the Summit switch AC power cord into a different circuit breaker than the circuit breaker to which the Summit Virtual Chassis AC power socket is connected.

REDUNDANT POWER SUPPLY PORTS

The Summit Virtual Chassis has two RPS ports. Each port connects to a different Summit switch.

Figure 5 shows the rear view of a rack that has one Summit switch mounted above the Summit Virtual Chassis and one Summit switch mounted below. The upper switch is cabled to the upper RPS port; the lower switch is cabled to the lower RPS port.

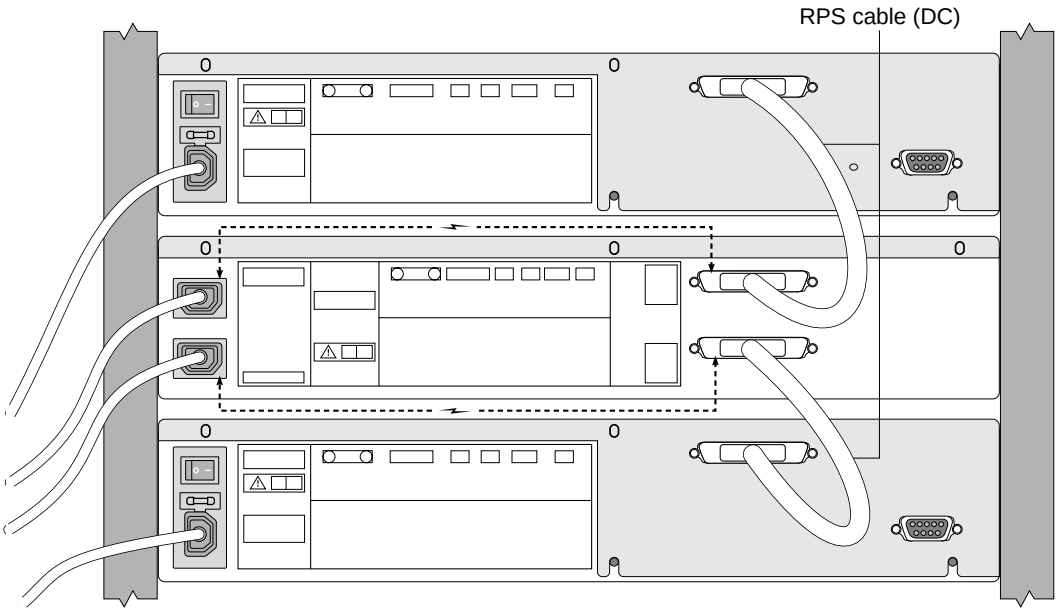

Figure 5: Summit Switches connected to a Summit Virtual Chassis

The upper power socket on the Summit Virtual Chassis provides the AC source for backup power for the upper switch; the lower power socket provides the AC source for backup power for the lower switch.

SUPPORTED CONFIGURATIONS

The following two types of Summit Virtual Chassis configurations are supported:

- Single Virtual Chassis stack
- Parallel Virtual Chassis stack (using two or four Summit Virtual Chassis)

A Virtual Chassis *stack* is any valid Virtual Chassis configuration that includes the Summit Virtual Chassis and Summit switches. A parallel Virtual Chassis stack can consist of two or four Summit Virtual Chassis. Multiple stacks can be combined using traditional bridging and routing system design elements.

A single Summit switch can be connected to multiple Summit Virtual Chassis units. However, you can have only one connection between any one Summit switch and any one Summit Virtual Chassis. In addition, a Summit Virtual Chassis cannot connect directly to another Summit Virtual Chassis.

You cannot use the redundant Gigabit Ethernet port to connect to a Summit Virtual Chassis.

SINGLE VIRTUAL CHASSIS STACK

In a single Virtual Chassis stack, one Summit Virtual Chassis can be connected to a maximum of eight Summit switches. A single Virtual Chassis stack is shown in Figure 6.

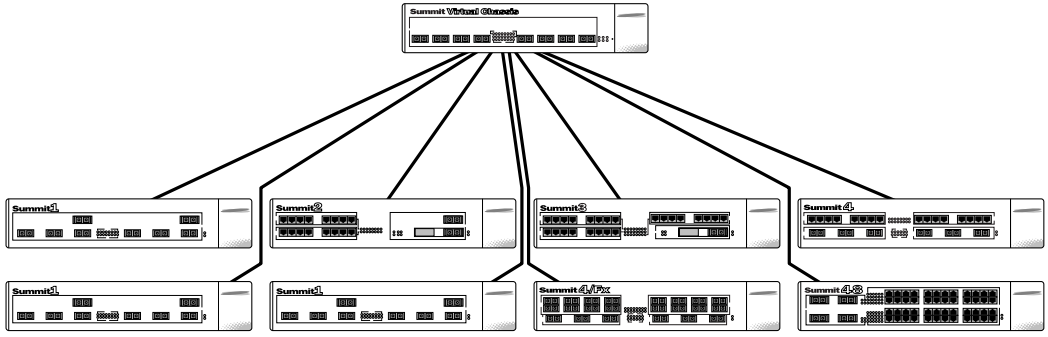

Figure 6: Single Virtual Chassis stack

One Gigabit Ethernet port from each of the Summit switches is cabled to the Summit Virtual Chassis. The maximum distance between the Summit switch and the Summit Virtual Chassis is 260 meters. Each Summit switch continues to operate independently. The Summit Virtual Chassis does not act as an OSI layer 2 bridge hop or an OSI layer 3 router hop. It is transparent to layer 2 and 3 protocols.

It is recommended that you use a single Virtual Chassis stack when using the Summit3 switch. A single Virtual Chassis stack can also be used with Summit1, Summit2, Summit4, and Summit48 switches.

The Summit Virtual Chassis can provide redundant power for two of the Summit switches shown in Figure 6. For the other Summit switches to have backup power, you must use a Summit RPS. The Summit RPS provides power to up to two Summit switches. Figure 7 shows the single Virtual Chassis stack with the addition of a Summit RPS.

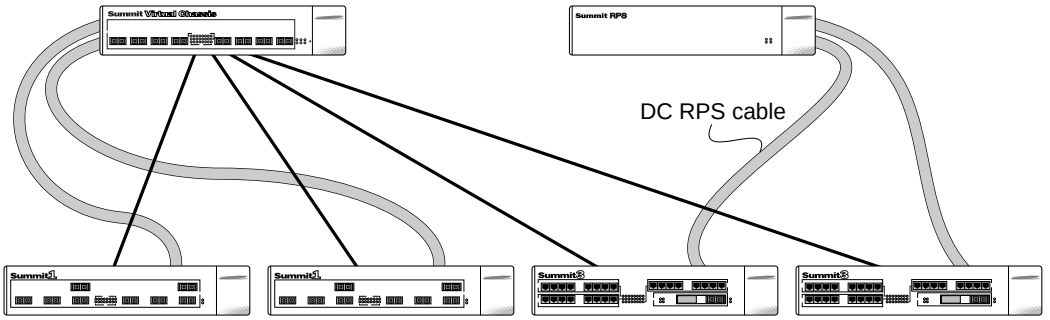

Figure 7: Single Virtual Chassis stack with a Summit RPS

For more information on using a Summit RPS, refer to the Summit Redundant Power Supply Installation Guide*.*

PARALLEL VIRTUAL CHASSIS STACK

The parallel Virtual Chassis stack uses two or four Summit Virtual Chassis to provide redundant load-sharing port configurations for up to eight Summit switches. You can use two Summit Virtual Chassis with Summit2 and Summit48 switches, and four Summit Virtual Chassis with Summit1 and Summit4 switches.

PARALLEL VIRTUAL CHASSIS STACK USING TWO SUMMIT VIRTUAL CHASSIS UNITS

A parallel Virtual Chassis stack using two Summit Virtual Chassis is used to connect up to eight Summit2 or Summit48 switches.

The Summit2 switch has two Gigabit Ethernet ports, labeled port 17 and port 18. The Summit48 switch has two Gigabit Ethernet ports, labeled port 49 and port 50. For a parallel Virtual Chassis configuration, port 17 on the Summit2 or port 49 on the Summit48 is cabled to one of the ports on one of the Summit Virtual Chassis. Port 18 on the Summit2 or port 50 on the Summit48 is cabled to the second Summit Virtual Chassis. You must use the same port number on each of the two Summit Virtual Chassis.

For example, in Figure 8, two Summit2 switches, labeled Switch A and Switch B, are cabled to two Summit Virtual Chassis, labeled Chassis 1 and Chassis 2.

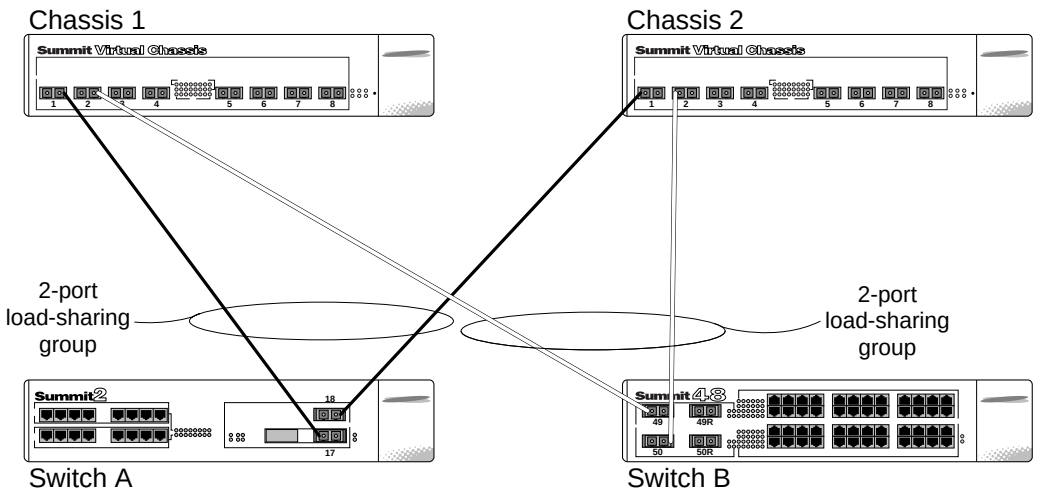

Figure 8: Parallel Virtual Chassis stack example using Summit2 and Summit48 switches

Switch A is cabled to port 1 on each Summit Virtual Chassis. Switch B is cabled to port 2 on each Summit Virtual Chassis.

The port connections between the Summit switches and the Summit Virtual Chassis shown in Figure 8 are as follows:

- Port 17 on Switch A is cabled to port 1 on Chassis 1.
- Port 18 on Switch A is cabled to port 1 on Chassis 2.
- Port 49 on Switch B is cabled to port 2 on Chassis 1.
- Port 50 on Switch B is cabled to port 2 on Chassis 2.

Summit switch connections must be cabled to the same port numbers on both Summit Virtual Chassis. If not, communication among the switches will not operate properly.

PARALLEL STACK USING FOUR SUMMIT VIRTUAL CHASSIS UNITS

A parallel Virtual Chassis stack using two or four Summit Virtual Chassis is used to connect up to eight Summit1 or Summit4 switches, as shown in Figure 9.

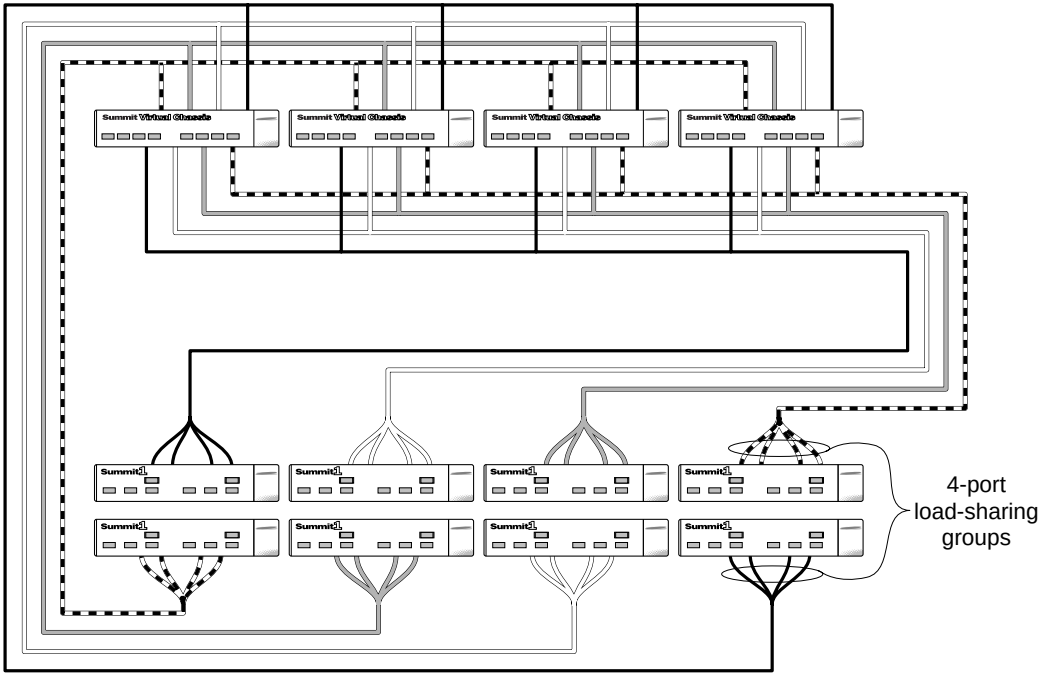

Figure 9: Four parallel Virtual Chassis stack using eight Summit1 or Summit4 switches

In a parallel Virtual Chassis configuration using Summit1 or Summit4 switches, up to four ports per Summit switch can be cabled to four different Summit Virtual Chassis. Each switch must be cabled to the same port number on each Summit Virtual Chassis.

In a smaller detailed example shown in Figure 10, Switch A is cabled to four Summit Virtual Chassis, labeled Chassis 1, Chassis 2, Chassis 3, and Chassis 4. Switch B is also cabled to the four Summit Virtual Chassis.

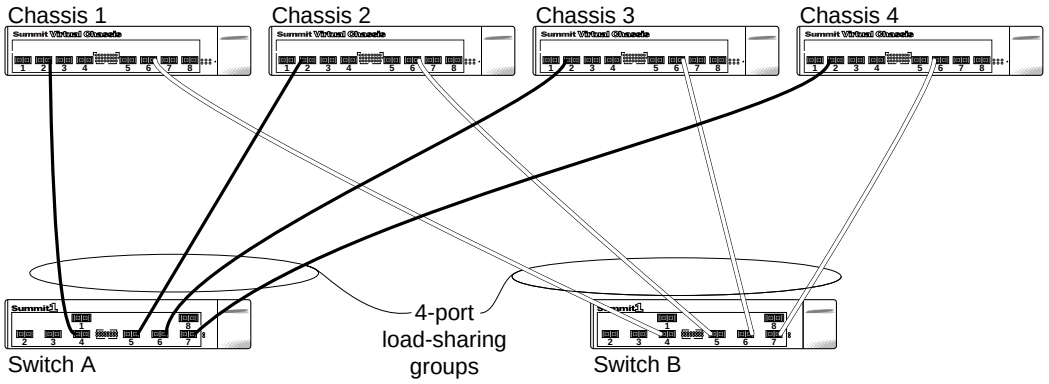

Figure 10: Detailed example using four Virtual Chassis units

Switch A uses port 2 on each Summit Virtual Chassis; Switch B uses port 6. The port connections between the Summit1 switches and the four Summit Virtual Chassis are as follows:

- Port 4 on Switch A is cabled to port 2 on Chassis 1.
- Port 5 on Switch A is cabled to port 2 on Chassis 2.
- Port 6 on Switch A is cabled to port 2 on Chassis 3.
- Port 7 on Switch A is cabled to port 2 on Chassis 4.
- Port 4 on Switch B is cabled to port 6 on Chassis 1.
- Port 5 on Switch B is cabled to port 6 on Chassis 2.
- Port 6 on Switch B is cabled to port 6 on Chassis 3.
- Port 7 on Switch B is cabled to port 6 on Chassis 4.

Summit switch connection must be cabled to the same port numbers on all Summit Virtual Chassis. If not, communication among the switches will not operate properly.

COMBINING VIRTUAL CHASSIS STACKS

A Virtual Chassis stack functions as a single entity. Multiple Virtual Chassis stacks can be combined using traditional bridging and routing system design methods. For example, when combining Virtual Chassis stacks, loops are not permitted unless they use appropriate routing boundaries, or the Spanning Tree Protocol (STP).

Stacks can be combined in two ways. The first and most straightforward method uses available Summit switch ports in each stack to interconnect the stacks. When using this method, you must follow the same rules for connecting any Summit switch, including load-sharing rules, port redundancy rules, and so on.

The second method uses a Summit switch that is a member of both Virtual Chassis stacks. Using this method, you must adhere to the requirements of both stacks when connecting the switch. For example, a single port is used for connecting to a single Virtual Chassis stack; two ports are used for connecting to a parallel Virtual Chassis stack that has two Summit Virtual Chassis. Figure 11 shows two single Virtual Chassis stacks connected using a Summit1. The Summit1 is a member of both stacks.

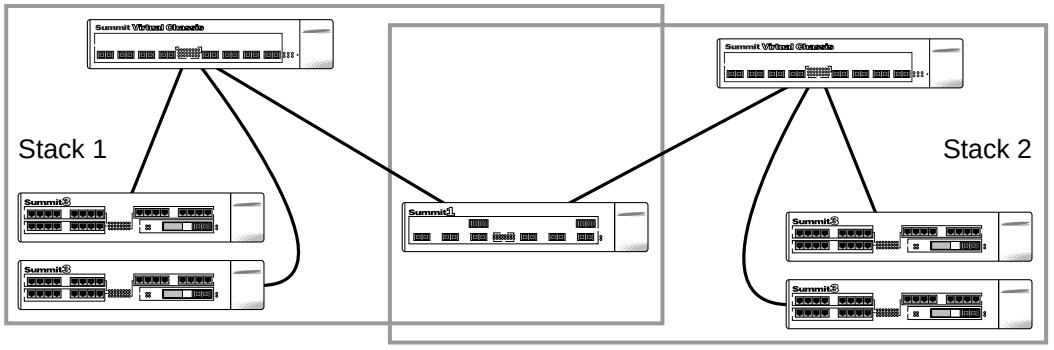

Figure 11: Combining Virtual Chassis stacks

Table 2 describes Summit switch support for the various Virtual Chassis stack configurations. The parallel Virtual Chassis stack information is identical to the load-sharing port configurations supported on Gigabit Ethernet ports for the Summit switch family.

Table 2: Summit Switch Support for Virtual Chassis Stacks

	Single Virtual Chassis Stack	Parallel Virtual Chassis Stack (2)	Parallel Virtual Chassis Stack (4)
Summit1	Any of ports 1 - 8	Ports 2 and 3, or Ports 4 and 5, or Ports 6 and 7	Ports 4, 5, 6, and 7
Summit2	Port 17 or Port 18	Ports 17 and 18	Not supported*
Summit3	Port 25	Not supported*	Not supported*
Summit4	Any of ports 17 - 22	Ports 17 and 18, or Ports 19 and 20, or Ports 21 and 22	Ports 19, 20, 21, and 22
Summit48	Port 49 or Port 50	Ports 49 and 50	Not supported*

*Can result in a lack of connectivity if a single failure occurs in the stack. Refer to the section, "Configurations to Avoid," for more information.

You must configure the Summit ports that will be used to connect to the Summit Virtual Chassis. For information on configuring Summit ports, refer to the Summit Switch Installation and User Guide*.*

CONFIGURATIONS TO AVOID

Some Virtual Chassis configurations may appear to work, but are not supported because their redundancy capabilities are quite limited. The following section has an example of this situation.

ADDING A SUMMIT3 SWITCH TO A PARALLEL VIRTUAL CHASSIS STACK

The Summit3 switch has one active Gigabit Ethernet port. Therefore, it can have one active connection to a Summit Virtual Chassis. Figure 12 shows how you would add a Summit3 to the example used in the parallel Virtual Chassis example using Summit2 switches, shown previously in Figure 8.

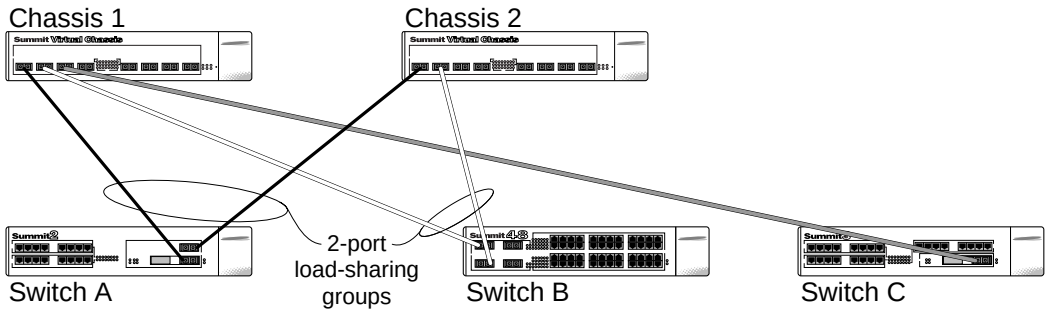

Figure 12: Adding a Summit3 switch to the parallel Virtual Chassis stack example

In Figure 12, the two Summit2 switches are connected to port 1 and port 2 of both Summit Virtual Chassis. The Summit3 can connect to port 3 on one of the Summit Virtual Chassis. Port3 of the other Summit Virtual Chassis must not be connected to any other Summit switch. Doing so can cause frames to be delivered to the wrong device.

The port connections between the Summit switches and the Summit Virtual Chassis shown in Figure 12 are as follows:

- Port 17 on Switch A is cabled to port 1 on Chassis 1.
- Port 18 on Switch A is cabled to port 1 on Chassis 2.
- Port 49 on Switch B is cabled to port 2 on Chassis 1.
- Port 50 on Switch B is cabled to port 2 on Chassis 2.
- Port 25 on Switch C is cabled to port 3 on Chassis 1.
- Nothing is cabled to port 3 on Chassis 2.

Connecting a device to port 3 on Chassis 2 can result in frames being delivered to the wrong switch.

Only Switch A and Switch B benefit from the load-sharing and redundancy capabilities of the parallel Virtual Chassis configuration. If either Switch A or Switch B loses its connection to Chassis 1, traffic is no longer be able to reach Switch 3, because Switch 3 is not connected to Chassis 2.

The same situation can occur if a Summit2 or a Summit48 is used in a parallel Virtual Chassis stack that consists of four Summit Virtual Chassis. Only Summit switches that support four links benefit from the redundancy capabilities. If specific links to other switches fail, the Summit2 can lose partial connectivity to the stack.

CONFIGURING SUMMIT SWITCHES FOR USE WITH THE VIRTUAL CHASSIS

The Summit Virtual chassis requires no configuration and has no user interface. You must configure each Summit switch that will be attached to a Summit Virtual Chassis. Several important aspects of configuring the Summit switch for use with a Summit Virtual Chassis are detailed in the *Summit Installation and User Guide*. These include the following:

- You must configure the Summit switch port(s) prior to connecting the switch to the Summit Virtual Chassis. Each connected port must be configured as a SummitLink port. If you are using a parallel Virtual Chassis stack, you must configure load-sharing on the Summit switch after the ports are designated as SummitLink ports.
- Summit switches exchange information across Virtual Chassis links for the purpose of automatically joining Virtual LANs (VLANs). A VLAN is automatically joined between Summit switches that are members of the same Virtual Chassis stack if the VLAN name and configured 802.1Q tag values are identical.

*The default VLAN on all Summit switches is joined through a Virtual Chassis stack because the VLAN name is the same (*Default*), and the explicit 802.1Q tag value is* 1 *on each switch.*

INSTALLING THE SUMMIT VIRTUAL CHASSIS

To install the Summit Virtual Chassis, follow these steps:

1 Mount the Summit Virtual Chassis in the equipment rack, or, if it will be located on a table, place the rubber feet on the bottom of the Summit Virtual Chassis.

For more information on installing the mounting brackets, refer to the Summit Switch Installation and User Guide*.*

2 If you are using the RPS ports on the Summit Virtual Chassis to connect one or two Summit switches, do the following:

a Using the supplied cables, connect the RPS port on the Summit Virtual Chassis to the RPS port on each Summit switch.

The RPS DC cable must be connected to the Summit switch prior to connecting the AC power cord to the Summit Virtual Chassis.

b Tighten the screws connecting both sides of the RPS cable.

Ensure that the cable is secured and is making good contact prior to turning on the Summit Virtual Chassis.

c Connect an AC power cord to each power socket.

d Plug the power cords into properly grounded AC outlets.

When disconnecting the Summit Virtual chassis, the AC power cords must be removed from the Summit Virtual Chassis before removing the RPS DC cables.

3 Connect the fiber-optic cable between each Summit switch port and each Summit Virtual Chassis port.

If you are cabling a single Summit switch to two Summit Virtual Chassis in a parallel configuration, ensure that you cable each switch port to the same port number on the two different Summit Virtual Chassis.

TECHNICAL SPECIFICATIONS

Physical Dimensions	Height: 3.5 inches x Width: 17.32 inches x Depth: 17.42 inches Weight: 18 lb (8.17 kg)
Environmental Requirements	
Operating Temperature	0 to 50 degrees C
Storage Temperature	-20 to 80 degrees C
Operating Humidity	5% to 95% relative humidity, noncondensing
Regulatory Compliance	EN55022 Class B FCC part 15 Class A CSA C108.8-M1983 (A) VCCI Class 2 EN50082-1 (IEC 801 Parts 2-4) EN61000 -3 -2 EN61000 -4 -3 EN61000 -4 -5 EN61000 -4 -6 EN61000 -4 -11 UL 1950 3rd Edition CSA 22.2 #950 EN60950:1992/A3:1995 TUV GS (Rheinland) CE Mark
Heat Dissipation	236W maximum (682.4 BTU/hr maximum)
Power supply	
AC Line Frequency	47Hz to 63Hz
Input Voltage Options	90VAC to 132VAC, 180VAC to 264VAC auto-selecting
Current Rating	100-120/200-240 VAC 4.0/2.0 A (for each power socket input/power supply)